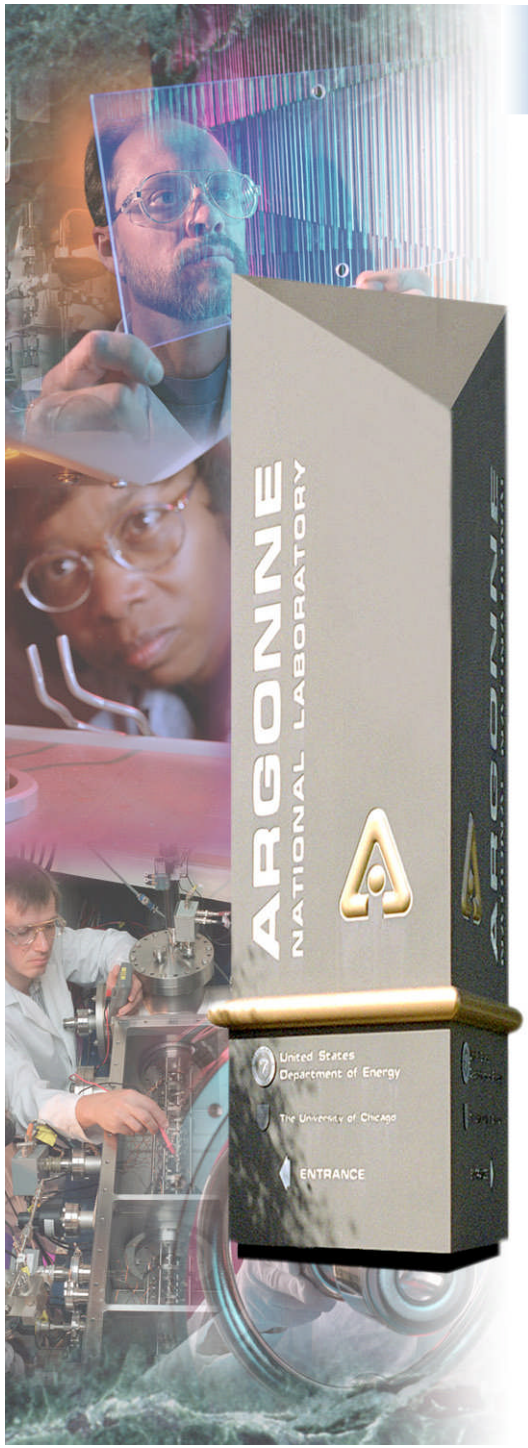

ARGONNE NATIONAL LABORATORY

IT Support for Unix/Solaris

David Wallis

December 13, 2005

THE UNIVERSITY OF CHICAGO

Office of Science
U.S. DEPARTMENT OF ENERGY

Argonne National Laboratory is managed by
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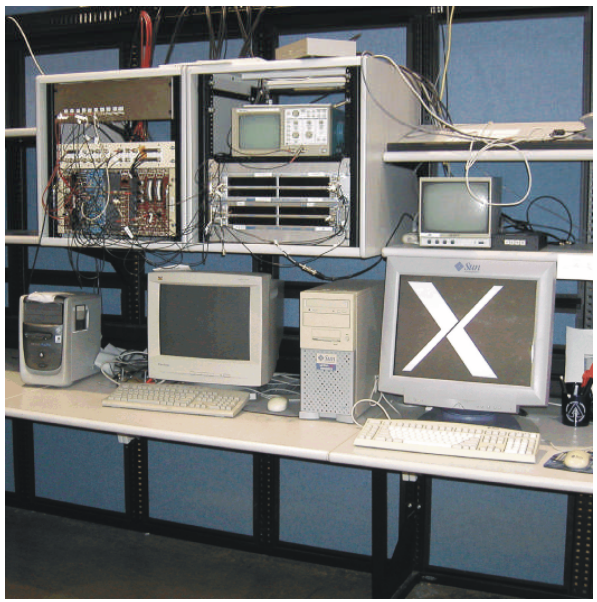
Unix/Solaris Administration Overview

We support Unix/Solaris in three primary environments:

- Accelerator and Operations
- Central Computing
- Beamline Computing



Unix Support for Accelerator and Operations

Goals:

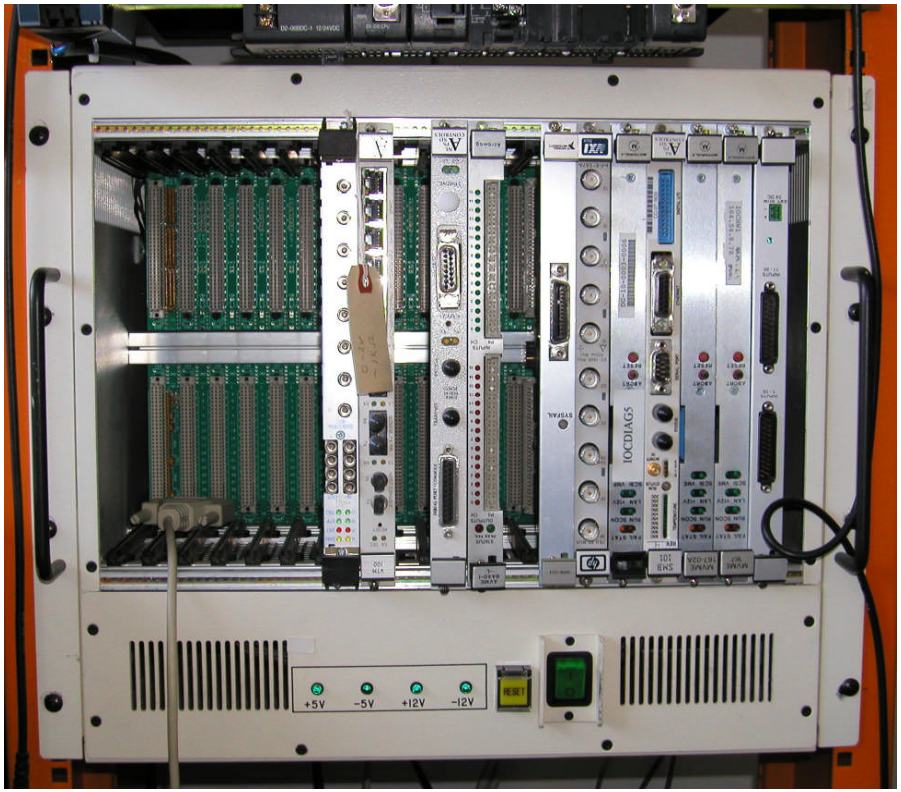
- Provide networking, servers and administration to support the operation of the APS accelerator and Main Control Room
- Help maintain the excellent uptime record of the APS by providing high availability hardware, redundant servers and networks,
- Aid accelerator research and analysis by maintaining and managing computing resources used by the OAG group.

Unix Support for Accelerator and Operations

Reliability and performance of accelerator servers and networks is critical to the uptime record of the APS.

We support:

- High-availability clustered file servers
- 300 IOCs (increasing to as many as 600)
- More than 90 Solaris and Linux workstations
- 11 operator consoles in the Main Control Room
- OAG group's Linux cluster
- 9 PV Gateway servers



Accelerator IOC

Unix Support for Central Computing

Goals:

- Support the operation of the APS by providing server and desktop computing, and networking resources for:
  - APS Directorate and managers
  - Engineers and drafters
  - Scientists
- Standardize computing platforms, software, administration, cyber security and logins/passwords throughout the APS
- Provide secure external access to APS computing resources
- Coordinate with ANL IT groups

Central Unix Servers

Unix Support for Central Computing

We Support and Provide:

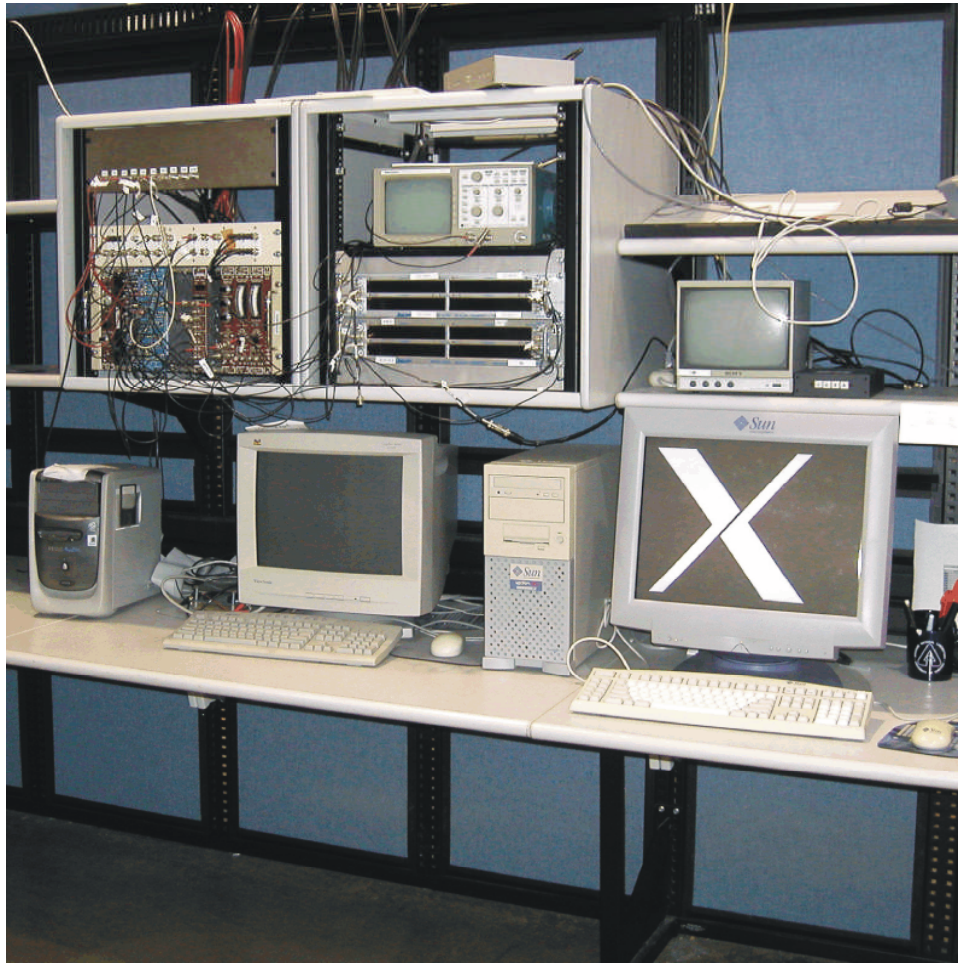
- Servers
  - 8 web servers
  - 4 Oracle/MySQL servers
  - 12 DNS servers
  - 4 email servers
  - Portal server for secure access to APS resources from off-site
  - Authentication servers (LDAP)
  - Print servers

Central UPS Units

- Services:
  - Web
  - Email
  - DNS
  - Portal
  - Database
  - Samba (PC access to Solaris file servers)
  - License servers for application software packages
  - CAD
  - ICMS

Beamline IT Support: Goals

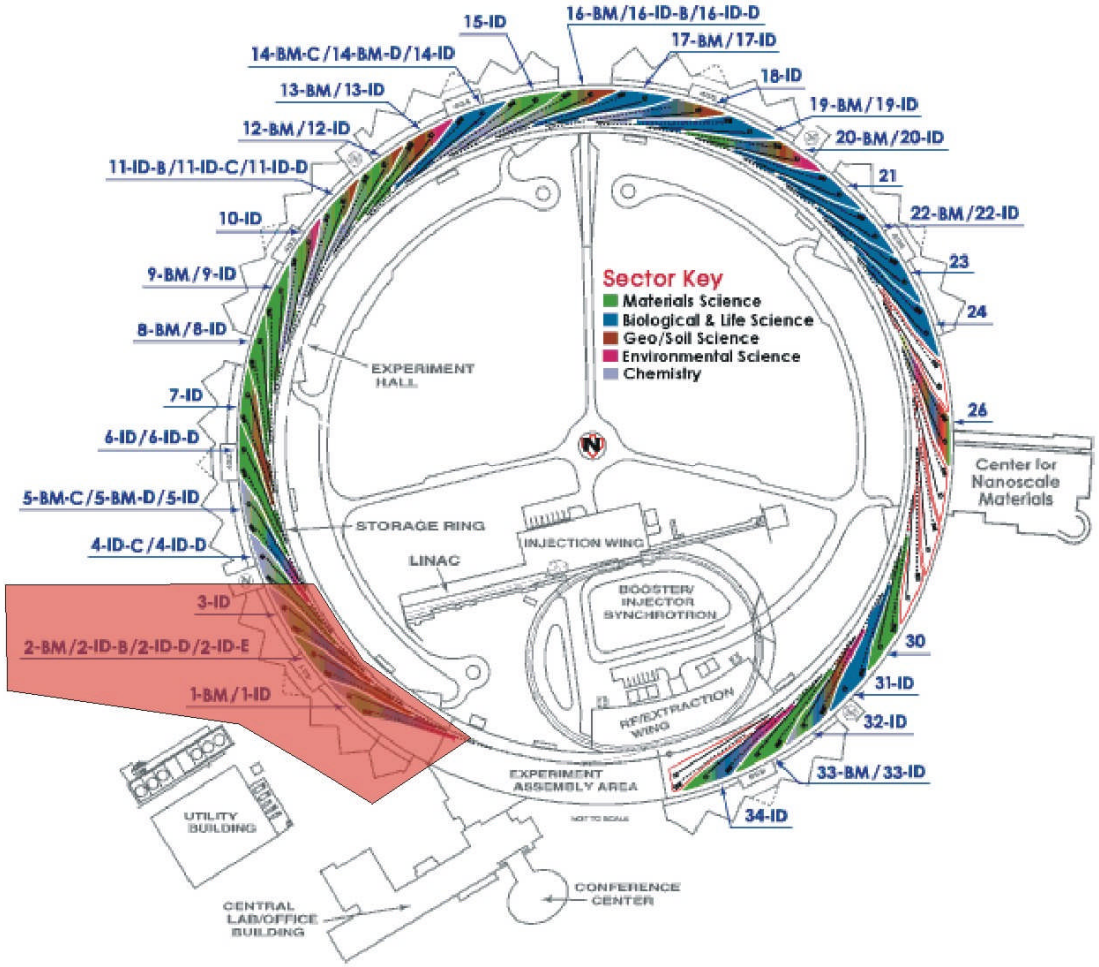
- Provide a reliable computing and networking environment for APS/XOR Beamlines that allows scientists to conduct experiments, collect scientific data, and share the data and results with outside researchers;
- Support Beamline operations so that scientists can concentrate on research and experiments, not on diagnosing and fixing computer problems;
- Anticipate the future needs of the APS research community, so that the Beamline computing and networking environments grow as the experiments and technology grow, to ensure that Beamline operations remain reliable and efficient.



Typical Beamline Experiment Station

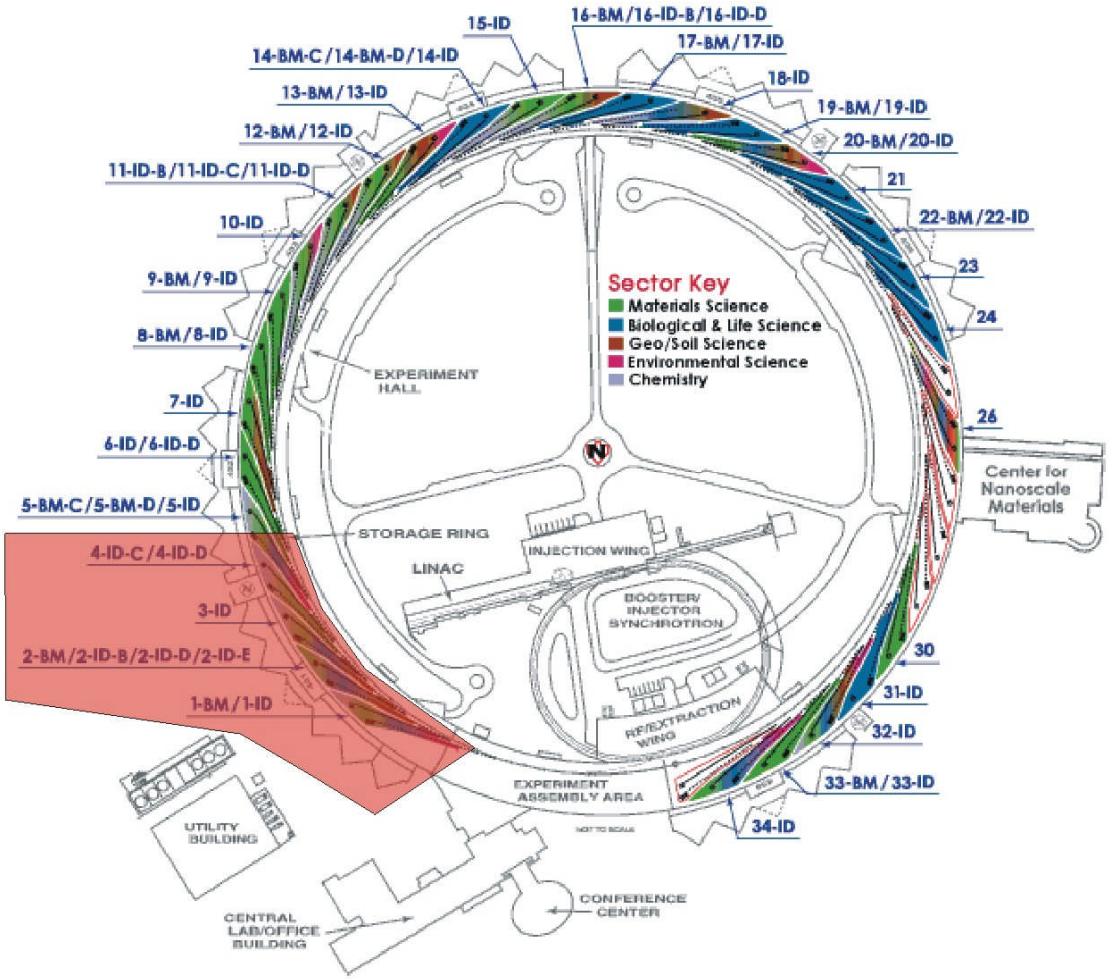
Beamline IT Support: Who We Serve

- In 1994, what was then SRI-CAT comprised sectors 1 - 3



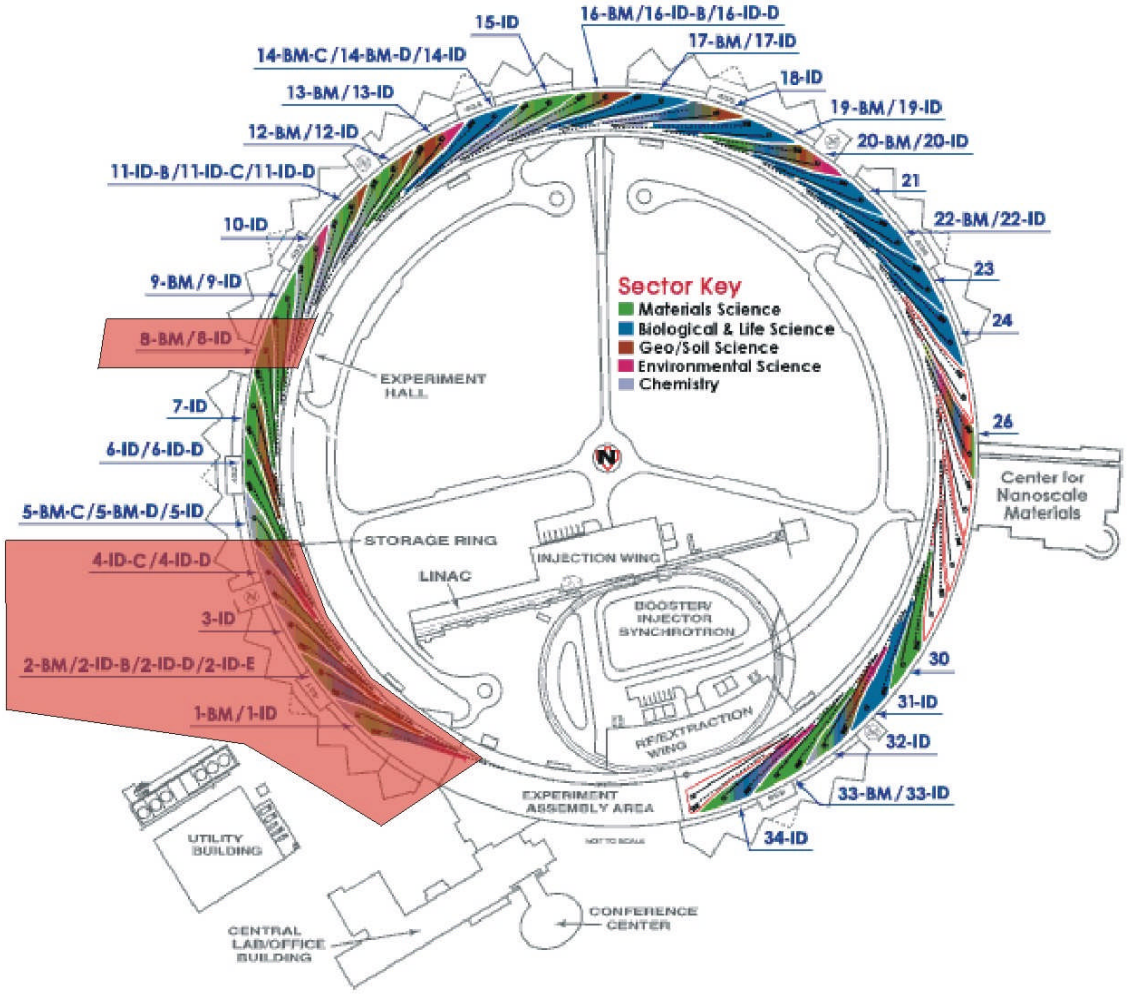
Beamline IT Support: Who We Serve

- In 1997, Sector 4 was added



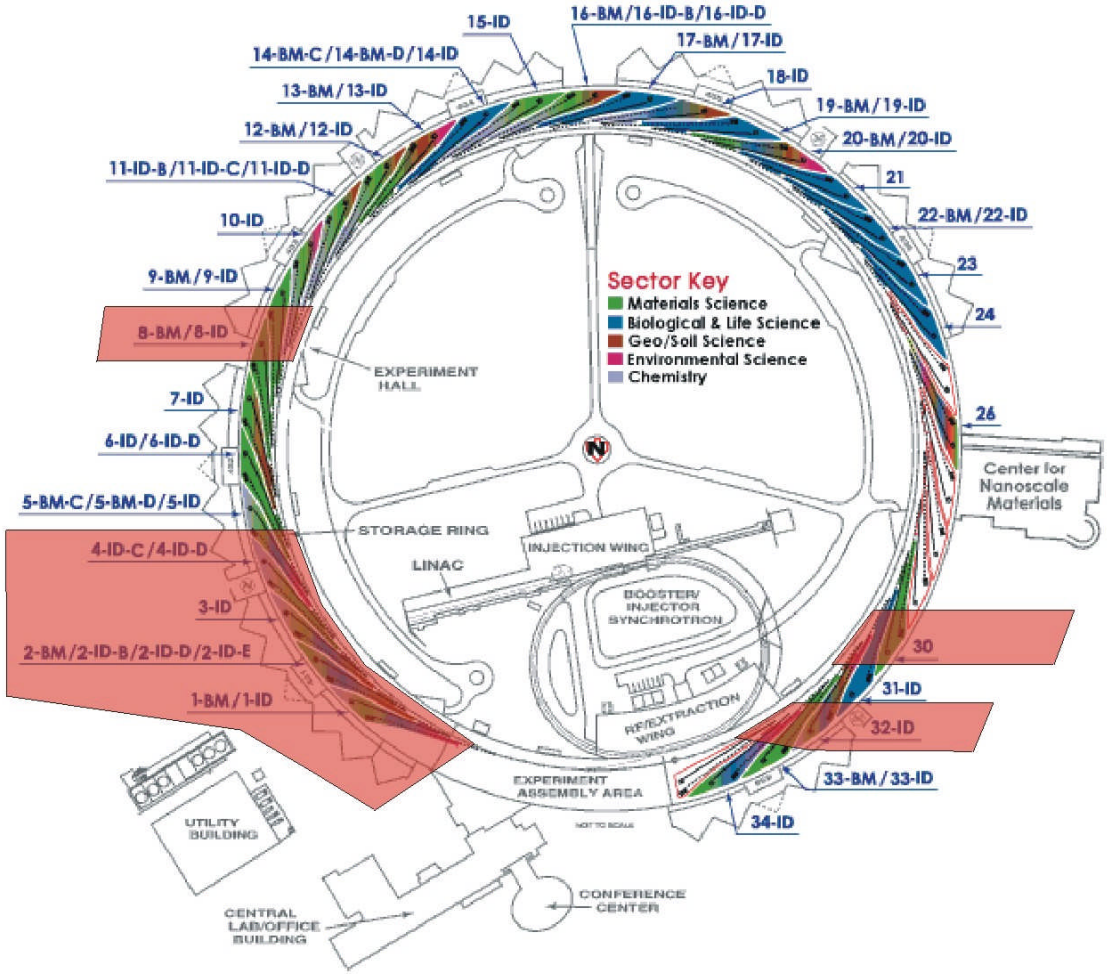
Beamline IT Support: Who We Serve

- In 2003, Sector 8-ID was added



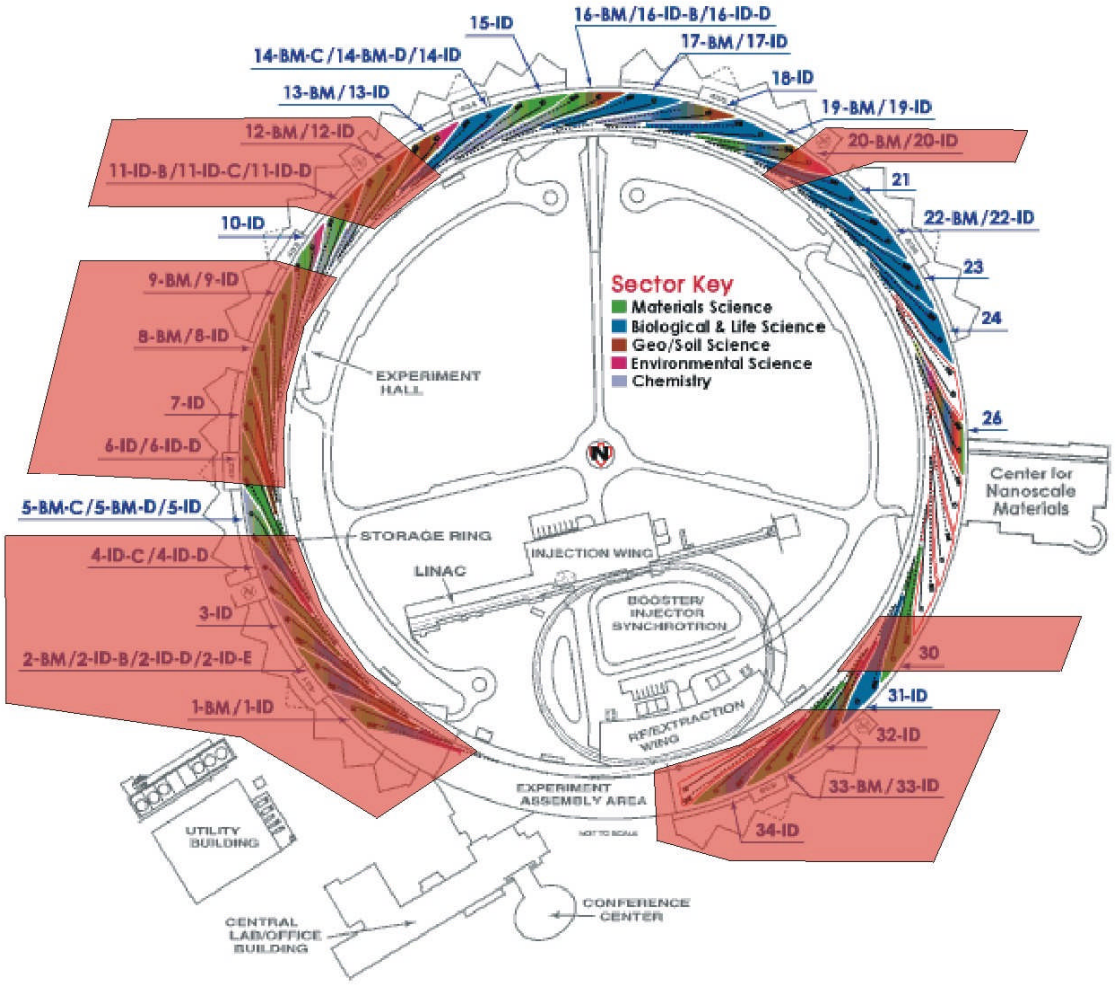
Beamline IT Support: Who We Serve

- In 2005, Sectors 30 & 32 were added



Beamline IT Support: Who We Serve

- In 2006, Sectors 9, 33 and 34 will be added,
- In the future, Sectors ????? will be added.

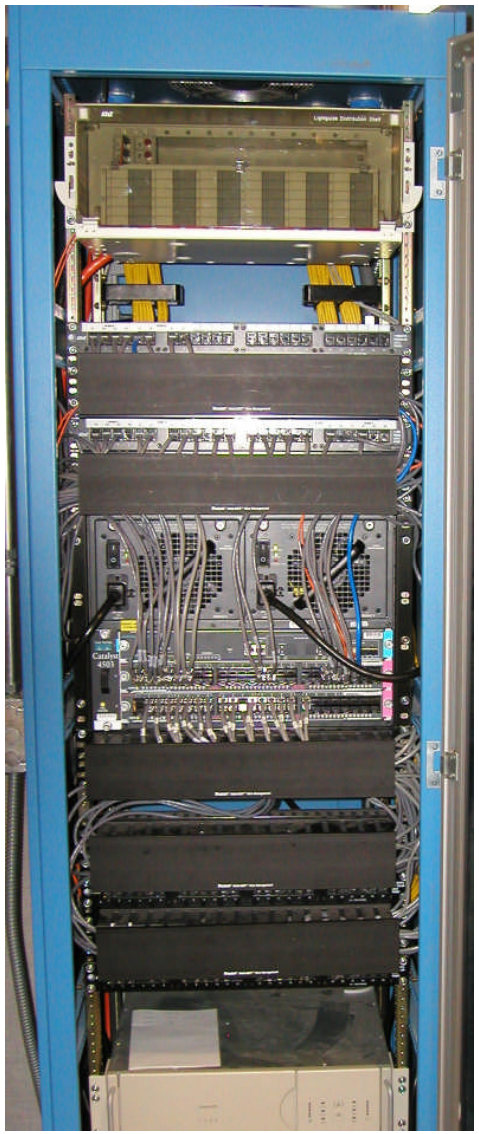


Beamline IT Support – Services We Provide

Networking

Networking is critical for beamlines to operate experiments, as well as for sharing data and results with outside collaborators.

- ✓ We're currently upgrading existing XOR sectors to new switches that provide gigabit networking to the desktop.
- ✓ Each beamline switch has redundant gigabit fiber backbone connections.
- ✓ Sector switches are ready to support 10-gigabit backbone.
- ✓ We are currently supporting approximately 250 active network connections on XOR beamlines.



Beamline Network Rack, Front & Back

Beamline IT Support – Services We Provide

Central Servers – File Servers and Storage

File servers provide access to over 30 terabytes of centralized storage for XOR beamlines.

✓ Sun Fire E4900 High Availability File Servers provide redundant servers for XOR scientific and user data. In the event of a system failure, the other server takes over responsibility for all file systems

✓ Sun StorEdge 6320 Storage System provides expandable, high-performance, high availability data storage. Redundant controllers, hot spare disk drives and a storage management processor allow data to remain on-line even in the event of multiple disk failures.

Sun Fire E4900 File Server

Sun StorEdge 6320 Storage System

Beamline IT Support – Services We Provide

Central Servers – Subsidiary Servers

These servers provide services that allow experimenters to communicate with each other, as well as outside collaborators.

- ✓ Provide services to users other than file services:
  - ✓ E-mail, E-lists
  - ✓ Web Server
  - ✓ Database
  - ✓ Ftp Server
  - ✓ Access for outside investigators
- ✓ Servers have redundant ethernet & system disks
- ✓ Servers have backups that take over automatically in the event of a system failure on the primary server.

XOR Subsidiary Servers

Beamline IT Support – Services We Provide

Central Servers – Distributed Services Servers

These servers provide distributed network services where the server must reside on each sector's network.

- ✓ Provide services to beamline users' subnets:
  - ➢ Name Servers
  - ➢ DHCP Servers
  - ➢ Boot Servers (Solaris and IOC)
  - ➢ EPICS and BCDA software distribution
  - ➢ LDAP Directory Service
- ✓ Servers have redundant ethernet & system disks
- ✓ Servers have backups that take over automatically in the event of a system failure on the primary server.

Beamline Distributed Services Servers

Beamline IT Support – Services We Provide

Beamline Workstation Support

- ✓ Solaris (102 computers)
- ✓ Linux (51)
- ✓ Windows (144)
- ✓ Apple Mac (31)
- ✓ Printers (19)
- ✓ IOCs (107)
- ✓ Others, e.g. web cams (20)

(Total: 474 beamline computers/devices)

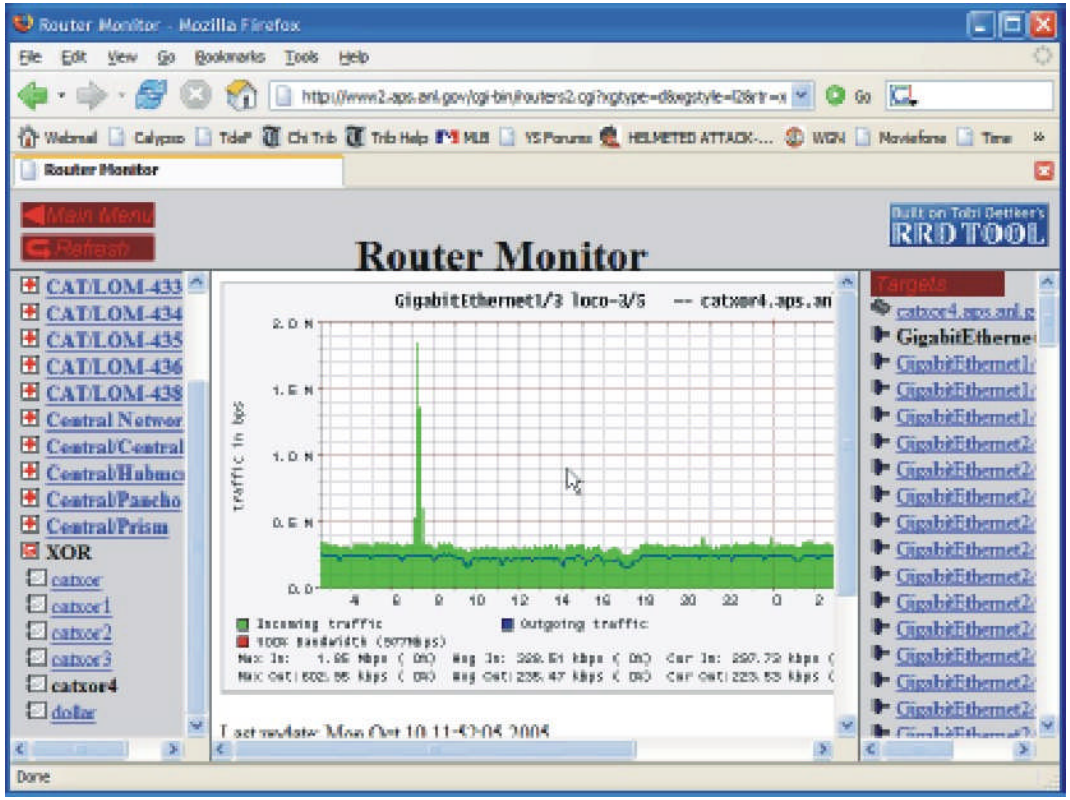
We support many different types of workstations, based on the needs of the beamline scientists. Some needs are driven by technology (e.g., processor speed), some by budget requirements, still others by software or detector vendors' requirements.

Beamline User Workstation

Beamline IT Support – Services We Provide

Additional Services

- ✓ Server, network and workstation performance and problem montitoring
- ✓ File system backup and restore (scientific and user data)
- ✓ Day-to-day support requests and Help Desk
- ✓ Cyber Security (monitoring, patches, network scanning, etc.)
- ✓ Compiling and installing open-source software, at users' request
- ✓ Consultation with XOR beamlines and non-XOR CATs regarding computer purchases, network design, problems, etc.



Network Performance Monitoring

Beamline IT Support: Current Philosophies, Future Directions

Goals:

- To continue to meet the needs of our user community by maintaining high reliability and performance of our networks and servers, while at the same time looking for ways to reduce costs;
- To contribute to the efficient use of APS beamlines by anticipating users' needs, and provide state-of-the-art solutions to beamline operations needs – do our best to keep ahead of the "technology curve";
- Improve our response time to user requests, and improve communication with beamline users.

Beamline IT Support: Current Philosophies, Future Directions

Reliability:

- High-Availability (HA) hardware (servers and networks)
  - File servers have multiple system controllers and redundant network, disk I/O interfaces
  - Other servers have redundant system disks, warm spare servers
- High-Availability clusters and “simple clusters”
  - Sun HA Cluster technology allows file servers to continue to operate if one fails or is removed from service for scheduled maintenance
  - We are developing “simple cluster” software to provide similar “fail-over” capabilities for other servers and services (“simpler” equates to less expensive, easier to install and maintain)

New Technology:

- DVD Data Transfer Service
- Hierarchical Storage Management / Scientific Data Archive
- Beamline Status Information

Beamline IT Support: Current Philosophies, Future Directions

DVD Data Transfer Service:

- Problem: beamline experiments are generating larger and larger data files at higher and higher rates. Visiting scientists want to take data home with them when they leave the APS.
- Solution: An automated, scalable DVD authoring system that allows users to submit requests to save experiment data to DVD. The system burns and labels DVDs, can scale up to 700 DVDs per day.

Beamline IT Support: Current Philosophies, Future Directions

Hierarchical Storage Management (HSM):

Three levels of storage:

1. High-performance disk (spooling current experiment data)
2. Low-cost disk (e.g. experiment data from the last run)
3. Archival storage (tape backup, older scientific data)

✓HSM allows us to match performance (and therefore price) to the specific requirements of each level of storage

✓Each level costs about 1/10 the price/unit of storage compared to the level above it

✓Rules-based software automates movement of data up/down the storage hierarchy

6300 Storage System

3511 SATA Arrays

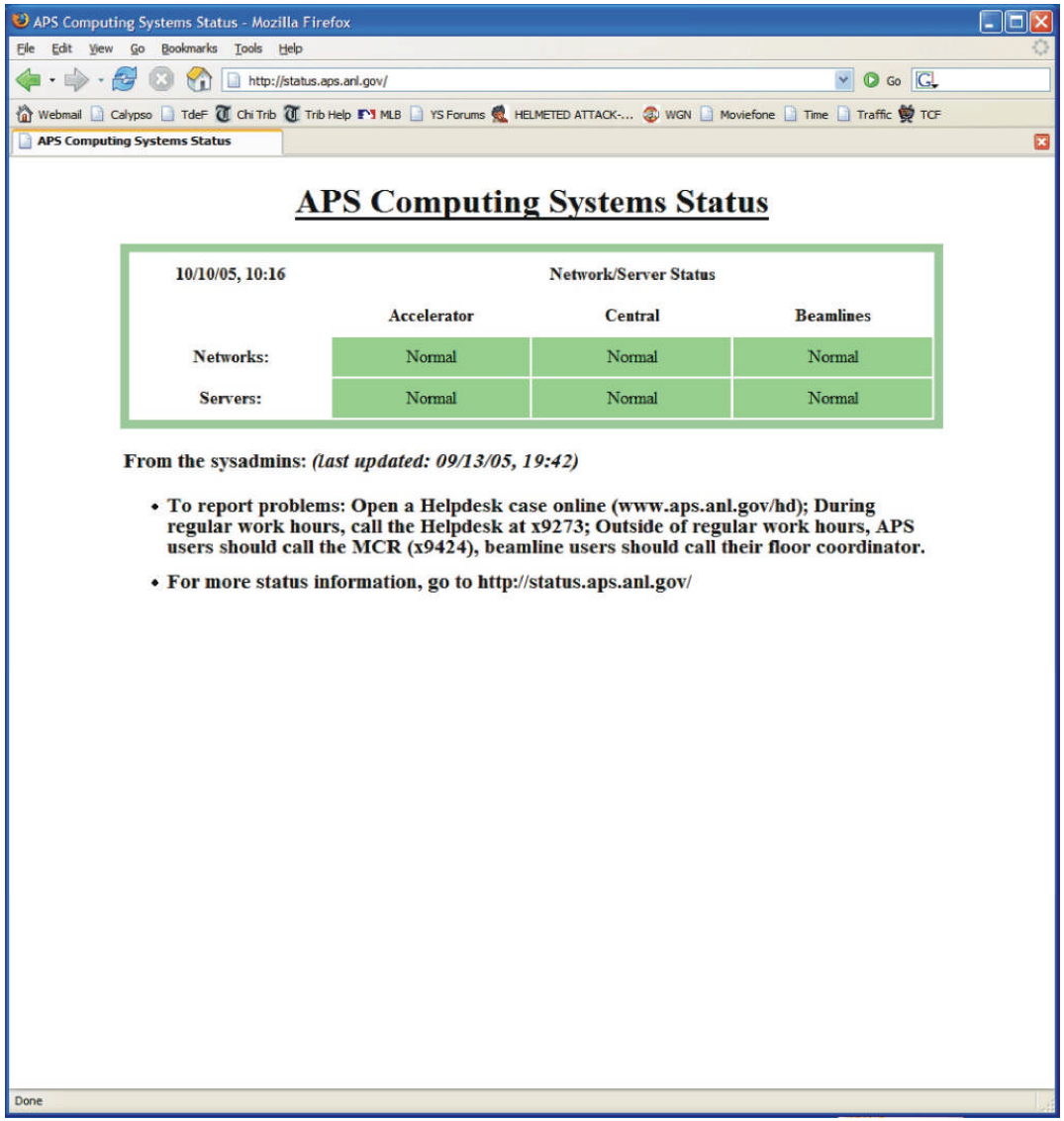
L500 Tape Library

DVD Jukebox

Beamline IT Support: Current Philosophies, Future Directions

Beamline Status Information:

- Problem: Getting information out to beamline users regarding problems, scheduled downtime, etc.
- Solutions:
  - Email lists with web archive,
  - “Status” page on CCTV and web,
  - “Status” page will be provided via EPICS and MEDM screens.



Beamline IT Support: Challenges

1. **Keeping up with data storage demands of beamline users**

2. **Supporting new XOR sectors, while maintaining the current level of support for existing sectors, with current staff levels**